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ABSTRACT

This report examines energy-related vocational programs at two-year colleges and discusses the factors to be considered in the future development of these programs. The report first presents the major findings of five surveys conducted between 1975 and 1979 to determine the number of degree and certificate programs offered in energy-related areas. Two tentative conclusions based on these results are: (1) that the number of degree and certificate programs remained stable due to a variety of factors including the traditional conservatism of higher education, the time required to move from program conception to implementation, and a lack of information on energy technology skill requirements; and (2) that the number of non-degree, informational programs increased. The report then discusses the need to plan energy-related education within the societal context of the college's service district, taking into consideration area employment and economic development. The findings of a study conducted in Nassau and Suffolk Counties, New York, to determine the probable economic impact of energy conservation and solar energy utilization are cited examples of surveys of the kind of information needed by colleges in planning energy vocation programs. The report concludes that until more such information is available, the current emphasis on non-degree programs is appropriate. (JP)

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ENERGY EDUCATION PROGRAM DEVELOPMENT IN TWO-YEAR POSTSECONDARY INSTITUTIONS A LOOK AT NATIONAL SURVEYS

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ENERGY EDUCATION PROGRAM DEVELOPMENT IN TWO-YEAR POSTSECONDARY INSTITUTIONS A LOOK AT NATIONAL SURVEYS*

My intention in this presentation is to share with you some quick glances at the results of a few national surveys aimed at gauging the extent of two-year postsecondary energy-related occupational programming in this country. I will also make a few suggestions about the directions this programming should take in the near future.

The number of two-year postsecondary education institutions offering degree and certificate programs in the last seven or eight years in this country has been relatively stable. While the studies and surveys which have been applied to record this development suffer from incomprehensiveness, inconsistencies in definitions, and differences in proposes, they do offer a useful (while not necessarily precise) picture of growth trends in the institutions.

In 1976, Oak Ridge Associated Universities reported on a national survey it conducted from October 1975 through January 1976 of all two-year postsecondary institutions. The report was prepared in cooperation with AACJC. The survey polled 1,152 institutions with a return rate of 67%. The report showed that 53 colleges offered 62 energy-related programs at that time. ("Program" refers to credit courses leading toward a certificate or degree. Calculations did not include offerings which did not lead to a certificate or degree, nor programs which were less than six months in duration.) It reported further that 111 colleges planned new energy programs. The breakdown by energy area was:

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Energy Area	colleges with programs	colleges planning programs
petroleum	12	9
coal mining	17	12
nuclear	18	17
solar	1	30
laser-optics	4	8
geothermal	0	6
energy (general)	0	16
conservation	1	13
TOTALS:	53	111

One conclusion which emerges from the Oak Ridge study is that while some modest energy-related programming existed in the 1975-76 academic year, college plans indicated that the number involved would more than double in the near future.

In the spring of 1978, AACJC conducted its own national survey of two-year colleges to assess the variety and scope of existing energy technican courses. The survey results were prepared as a resource document for a Department of Energy (DOE)-sponsored national conference. The one-time survey polled 903 AACJC member institutions and had a return rate of 35%. The report presented information for academic year 1977-1978, two years after the Oak Ridge study. In contrast to the Oak Ridge study, the AACJC survey included details on all energy-related courses as well as on degree and certificate programs. It reported the following:

*Number of Institutions Offering Energy Curriculi
By Field and Kinds of Offering

FIELD	CREDIT COURSES		DEGREE PROGRAMS		CERTIF. PROGRAMS		NON-CRED		TOTAL	
	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Act.	Plan
Conservation	31	9	4	2	3	1	34	4	72	16
Solar	37	12	6	9	6	7	38	7	87	35
Coal	3	0	8	0	0	0	0	0	11	0
Petroleum	2	0	7	1	1	1	2	2	12	4
Wind	1	0	0	0	0	0	0	0	1	0
Geothermal	0	0	0	1	0	1	0	1	0	3
Nuclear	1	5	5	1	0	0	2	2	8	8
Construction Energy	2	0	2	1	0	0	1	0	5	1
Applied Energy Tech (Combination of Wind, Solar, Geothermal, & Nuclear)	5	4	1	5	0	2	6	2	12	13
Total Number	82	30	33	20	10	12	83	18	208	80

*ADAPTED FROM: A Survey of Energy Programs In Two-Year Colleges and Technical Institutes, Bette Everett Hamilton, AACJC, Table 1, page 9, December, 1978.

While this survey reported on less than half of the number of colleges on which the Oak Ridge study was based, it still identifies 43 colleges with degree and/or certificate programs. More importantly, it shows that 165 institutions were offering a variety of courses, seminars, workshops and other forms of energy-related instruction not leading to a degree or certificate.

One of the conclusions of the AACJC study was: "This survey indicates that energy-related offerings at most two-year technical and community colleges are minimal to non-existent." (Foreword) While this statement may be too firm a judgment based on the results of a limited study, useful explanations are presented which help clarify the apparent slowness of the colleges to involve themselves in energy-related programs. Among the explanations are:

A. Required demand studies for their local area in respect to employment opportunities had not been implemented.
B. State plans which would permit the adoption of programs in local colleges had not been established.
C. Colleges needed more information regarding: skill requirements of individual energy occupations, employment opportunities for trainees, available curricula and textbooks, funding sources, and experts who might help in the creation of such programs.

Three other reports on two-year postsecondary energy programming, covering the same period as the AACJC report, offer more comprehensive information.

The Solar Energy Research Institute (SERI) National Solar Energy Education Directory (January 1979) shows that in the 1978-79 academic year more than 225 two-year postsecondary education institutions offered solar energy programs. (This number contrasts with the 87 reported in the AACJC report.) The typical solar energy program/course covers several alternative energy sources, including wood, wind, alcohol, etc. The SERI staff indicates that it expects to record substantially more 2-year postsecondary programs in the 1980 directory.

The Coal Task Report on Education and Training (January 15-17, 1979), while not canvassing all institutions, also covers the 1978-79 academic year. It shows that 20 two-year postsecondary institutions were offering 12 certificate and 21 degree coal mining programs. The study also lists 4 four-year colleges and graduate institutions which offered credit, non-credit, certificate, and AAS degrees in coal mining.

In Energy-Related Training Activities: Assessment of Current Offerings, (Technical Education Research Corporation, January 1979), approximately 39 Associate of Arts and Associate of Arts in Science degrees are identified. Eight certificate programs are listed. (These numbers were extrapolated from charts.) The areas in which these degrees and certificates occurred are:

Title	Degree	Certificate	Total
1. Solar Technology	6		6
2. Alternate Energy Sources	1		1
3. Resource Management	1		1
4. Energy Awareness	1		1
5. Solar Building	1		1
6. Energy Audits	1		1
7. Environmental Design	1		1
8. Environmental Studies	1		1
9. Energy Conservation & Audit	2		2
10. Petroleum Technology	3		3
11. Energy Installation & Maintenance	1		1
12. Solar Engr., Installation & Maint.	1	1	2
13. Coal Mining Technology	4		4
14. Nuclear Technology	10		10
15. Nuclear Reactor Operator Tech.	1		1
16. Nuclear Radiation Control Tech.	1	1	2
17. Mining Tech. & Land Stablization	1		1
18. Energy Management	2		2
19. Environmental Studies and Solar		1	1
20. Mine Electrician		2	2
21. Oil Well Servicing & Maintenance		1	1
22. Mine Supervision		1	1
23. Mine Machine Maintenance		1	1
Total	39	8	47

By energy area, the degree and certificate programs breakout as follows:

FIELD	DEGREE	CERTIFICATE	TOTAL
Conservation	6		6
Solar	8	2	10
Petroleum	3	1	4
Coal	7	4	11
Nuclear	12	1	13
Alternative	1		1
Ecology	2		2
Total	39	8	47

(A chart identifying individual colleges and the programs each offers is presented in the appendix.)

More than 400 two-year postsecondary institutions are represented in this report. The vast majority of these institutions provided courses, seminars, workshops, and other sorts of short-term offerings. A summary of these efforts follows:

PROGRAM FOCUS	# of Institut.
Audit	20
Awareness	53
Conservation	86
Management	43
Nuclear	9
Petroleum	7
Solar	117
Coal	15
Ecology	19
Geothermal	2
Wind	2
Biomass	2
TOTAL	375

These numbers represent individual offerings. A single college may offer several different activities. These numbers do not include similar activities in institutions offering degrees or certificates.

In spite of the inconsistencies among these various surveys, two tentative conclusions are possible concerning the involvement of two-year postsecondary institutions in energy programming. The first is that the number of degree and certificate programs has remained relatively stable over the last five years. Some of the explanations for the stability include:

A. The traditional conservativism of higher education in regard to the development of new technology programs for which the need has not been proven at the local or district level;

B. The uncertainty of funding sources to support such development;

C. The paucity of information about curricula designs, instructional materials, expert consultants (and in fact the availability of these items) important to support development;

D. The time required to move from the program concept stage to implementation. (One writer suggests that it takes a minimum of five years to complete this process -- Walter J. Brooking, "Energy Related Technology Programs At The Non-Baccalaureate Postsecondary Level," October 27, 1976.);

E. The frequently shifting emphases of federal energy policies;

F. The impact of political events (oil embargoes, altered wheat agreements, on-again/off-again fuel pipelines, etc.); and

G. The dearth of information regarding current and emerging energy technologies and their skill requirements.

A second conclusion which may be reached by examining the details of the national surveys is that instead of moving into degree and certificate areas, the colleges are offering courses or sequences of courses, seminars, workshops, and public discussion opportunities for students and local citizens. Some of the offerings are presented as part of established curricula like Heating/Ventilation and Air Conditioning, an approach which is consistent with one of the recommendations made in the Oak Ridge report. The report states in regard to the creation of significantly more Solar Energy Technology programs for which there may not exist sufficient jobs to accommodate graduates: "Approximately 150 heating and air conditioning programs exist that could offer course sequences to introduce solar installation and maintenance." (page 2)

The important increase of the less-than degree/certificate programs is consistent with the conclusions in the report of the Energy Research and Development Administration (ERDA)-supported conference Energy Conservation Workshop for Community College Leaders, 1976, which reads in part: "The concept of 'citizen education' as espoused by ERDA and its Office of Conservation is ideally matched to the role and scope of the community college system." (page 2)

Further evidence that this movement will gain momentum in the near future includes:

- More than 450 community colleges are involved in the AACJC-administered Energy Forums program.
- Thirty of the 40 successful applicants to the DOE, Office of Consumer Affairs competition (November, 1979) to conduct alcohol fuels production workshops were community colleges.
- The stress in the Administration's energy policies falls on conservation, alternative fuels domestically produced, and greater utilization of coal. Community colleges are already involved in each of these areas in terms of raising public consciousness, retraining workers involved in energy-related occupations, and preparing technicians for energy-related jobs.
- The Administration's recent decision to reduce grain shipments to Russia, to buy the grain from farmers, and to support the conversion of the grain to fuel alcohol for the purpose of making gasohol will most certainly lead to increases in community college programming, given the already substantial participation of community colleges in alcohol fuels production training.

The danger in this sort of discussion is that the sharp focus on a single element of an environment blurs other aspects with which it is inextricably connected. That is, energy education programs do not exist singularly. They must be examined in the context of other significant and related issues. Quality of life, employment, health

employment, health and safety, life style and economic development are all issues which are affected by the decisions we make about energy programming. Educators at all levels should be sensitive to the impact their energy programming will have on these elements.

For example, one of the Oak Ridge suggestions is: "Education institutions should be preparing students to accept having to relocate to continue employment because of changing economic conditions. Cross-training of displaced workers for employment in other geographic regions could eventually become a major responsibility of some college." (page 21) It seems to me that this suggestion does not reflect a sensitivity to the full environment of considerations which would be affected by its implementation. It is in conflict with economic development principles, among others. For an institution in one community to train its people for jobs which exist only in other locations would be to contribute to the economic decline and deminished vitality of the community. Community health (economic, social, personal, etc.) depends on its capacity to hold its youth, on its ability to provide local industry with trained workers and to re-train the workforce as the needs of industry change, and on its capacity to provide community resources important to satisfying the non-work interests of citizens (recreation, learning, etc.).

The inter-relationship among these elements is complex, and it has not been fully analyzed to this date. But some progress is being made.

For example, the Council on Economic Priorities recently

published a text entitled Jobs and Energy: The Employment and Economic Impacts of Nuclear Power, Conservation, and Other Energy Options. It compares "the number and types of jobs which would be created by spending money on energy conservation and solar energy utilization with those provided by 1) the continued supply (and sometimes inefficient use) of energy from conventional sources, and 2) the building and operating of new nuclear plants." (page 5) As a case site, the study looks at Nassau and Suffolk Counties, Long Island, New York. Some of the findings of this study include:

A. "Over 40% of the typical Nassau/Suffolk resident's household energy consumption could be eliminated through energy conservation coupled with solar energy use." (page 10)

B. "Energy conservation and solar energy use in the Nassau/Suffolk region would stimulate 2.4 to 2.7 times as much employment in the U.S. economy as would use of an equivalent supply of oil, natural gas and electricity." (page 11) These figures take into account reduced employment in the energy supply industries and build in calculations of direct employment, indirect employment in supporting industries, and induced employment which results from the purchase of goods made possible by the increase of discretionary monies provided by savings on energy.

C. "The Nassau/Suffolk conservation scenario, which includes residential opportunities alone, could reduce foreign oil

imports twice as much as the 1150 MW (nuclear) unit proposed for Nassau/Suffolk use at Jamesport." (page 26)

The solar scenario used for comparison purposes in this study has two elements: solar domestic hot-water systems utilizing flat plate solar collectors supplemented by electric hot-water systems presently in homes in the region, and passive solar design homes, aimed at increasing the direct use of the sun's energy to heat homes in winter and reducing the sun's heating effect in the summer. Conservation measures included 37 generally simple approaches, from installation of storm doors and windows to automatic flue dampers to inspection and maintenance of heating and air-conditioning systems.

For educators one of the most interesting details of this study is that the direct jobs which would be created by the implementation of this scenario would be those for which secondary vocational education and two-year postsecondary technical and community colleges are well-suited. They include: home improvement workers, insulation installers, carpenters, plumbers, sheetmetal workers, and heating, ventilation and air conditioning workers.

It is the results of this kind of study which educators at all levels must have before they can make informed decisions about the energy-related occupational training opportunities which they should be offering. Until such information is available generally and until we are given the necessary inducement to contribute to the information, it seems to me that the tack the colleges have taken is the appropriate one. They should continue to introduce energy electives in appropriate existing curricula, provide seminars and

workshops on specific energy topics, and offer citizen awareness opportunities for the general community.

The energy situation in this country has been called a crisis legitimately. The Chinese use two characters for the word "crisis." One is for danger; the other for opportunity. From the perspective of education, the danger lies in rushing to implement technology programs before there is clear evidence that the graduates are needed. The opportunity lies in expanding our efforts to infuse existing occupational training programs with energy-focused courses while at the same time providing helpful information to the general population to improve their understanding of the nature of the crisis and to help them make their personal contributions to the solutions.

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Appendix A

I. AACJC Energy-Related Materials and Activities

A. Energy-Related Technology in Community and Junior Colleges, a study published in July, 1976 for ERDA, written by John R. Doggette of Oak Ridge Associated Universities, Oak Ridge, Tennessee in cooperation with AACJC.

B. Energy Technology Training Conference - Atlanta, Georgia October 27-29, 1976, ERDA-supported with focus on workshops in coal mining, nuclear, petroleum, and solar. Co-sponsored by AACJC. Proceedings report available at AACJC.

C. Energy Conservation Workshop for Community College Leaders, invitation conference in Chicago, November 3-5, 1976. Agenda stressed identification of technician training needs and roles community colleges could play in energy research and citizen education. Report available at AACJC.

D. AACJC Office of Governmental Relations survey conducted in spring 1978 to assess variety and scope of energy technician courses and curricula offered nationally in

community colleges. Report available at AACJC: A Survey of Energy Programs in Two-Year Colleges and Technical Institutes.

E. Appropriate technology roundtable at AACJC on July 19-20, 1979 with National Science Foundation support to pursue questions: Is there a role for community college in appropriate technology? Does the role include instruction, information, and/or catalyst for action? Report available at AACJC: Community College and Appropriate Technology.

F. In the summer 1979, the Energy Forums project was funded by the National Endowment for the Humanities and the Department of Energy with additional collaboration with Ted Turner's Atlanta Super Station and others. Currently, more than 450 colleges are participating. Coordinating colleges in each of the 10 federal regions were selected. The project purpose is to help local citizens understand energy conditions, the current and future impacts of energy costs and shortages on their lives, and the adjustments in life style which may be required. The program offers opportunities for citizens to express their ideas and concerns. Materials available at AACJC.

G. In August 1979, the Department of Energy funded the Energy Communications Center, a one-year program designed

to collect and disseminate information concerning community college energy programming including curriculum, courses, continuing education, construction, retrofitting (thermal drapes, double-pane windows, insulation, computer control of facility environment, lighting, double foyers, etc.) and others. The project will produce the following monographs:

- Energy Curriculum Guide
- Energy Conservation - Community College Approaches

Both will be available at AACJC in August, 1980. The Center is also working with the DOE, Office of Consumer Affairs on the recently funded Alcohol Fuels Production Workshops program. The successful applicants in this competition (30 of 40 are two-year postsecondary institutions) are identified in the January 1980 issue of The Energy Consumer. The Center is supporting Colby Community College, Colby, Kansas in producing a training manual and videotapes on alcohol fuels production.

Further, the Center is working with:

- National Center for Resource Development (an AACJC affiliated council) on its energy project. The NCRD program will produce a guide to community college energy program funding sources, a booklet of case studies, and recommendations for future activities.
- American Vocational Association on its Energy Awareness project (also DOE funded)

Brief descriptions of the NCRD and AVA programs are offered in the Energy Communications Center brochure.

Appendix B

DEGREE PROGRAMS

Extrapolations from:
Energy-Related Training Activities: Assessment of Current Offerings, TERC, Jan 1979, Texas

1.	Arkansas	Mississippi County Community College	Solar Technology	AA
2.	California	Cerro Coso Community College	Solar Technology	AA
3.	California	Citrus College	Alternate Energy Sources	AA
4.	California	Coastline Community College	Solar Technology	AA
5.	California	Foothill College	Resource Management	AA
6.	California	East Los Angeles College	Proj. in Awareness	AA
7.	California	Los Angeles Trade-Technical College	Solar Building	AA
8.	California	Los Angeles Valley College	Energy Audits	AA
9.	California	Los Rios-Amer. River	Environmental Design	AA
10.	California	Peralta-Alameda	Environmental Studies	AA
11.	California	San Diego	Solar Technology	AA
12.	California	San Jose Community College District	Solar Technology	AA
13.	Colorado	Arapahoe Community College	Energy Cons. & Audit	AA
14.	Colorado	Colorado NW Community College, Rangely	Petroleum Technology	AA
15.	Colorado	Community College of Denver, Golden	Petroleum Technology	AA
16.	Colorado	Community College of Denver, North	Energy Install. & Maint.	AA
17.	Colorado	Community College of Denver, Red Rocks	Solar Engineering, Install. & Maintenance	AAS
18.	Colorado	Trinidad State Junior College	Coal Mining Technology	AA
19.	Connecticut	Hartford State Technical College	Nuclear Technology	AA
20.	Florida	Brevard Community College	Solar Energy Technology	AA
21.	Flordia	Central Florida Community College	Nuclear Reactor Oper. Technology	AAS
22.	Idaho	Eastern Idaho V.T.	Nuclear Technology	AA
23.	Mississippi	Gulf Coast JR College, Jackson City Campus	Nuclear Radiation, Control Technology	AAS
24.	Ohio	Belmont Technical College	Mining Technology & Land Stabilization	AA(2)
25.	Ohio	Clark Technical College	Energy Management	AA
26.	Ohio	Muskingham Area Technical College	Petroleum Engineering Technology	AA
27.	Ohio	Rio Grande Community College	Mining Technology	AA
28.	Ohio	Terra Technical College	Nuclear Power	AA
29.	Ohio	University Campus	Energy Management	AA
30.	Pennsylvania	Community College of Beaver County	Nuclear Technology	AA
31.	South Carolina	Aiken Technical College	Energy Conservation Tech.	AA
32.	South Carolina	Denmark Technical College	Nuclear Eng: Technology	AA
33.	South Carolina	Florence-Darlington Technical College	Nuclear Eng. Technology	AA
34.	South Carolina	Tri-County Technical College	Nuclear Technology	AA

DEGREE PROGRAMS cont.

35.	Tennessee	Chattanooga St. Tech. Community College	Nuclear Technology	AA
36.	Texas	Texas St. Tech. Institute, Harlingen	Nuclear Tech. & Radiation Protection	AAS
37.	Virginia	Mtn. Empire Community College	Mining Technology	AAS
38.	Virginia	Southwest Virginia Community College	Mining Technology	AAS
39.	Washington(State)	Columbia Basin College	Nuclear Technology	AA

CERTIFICATE

1.	California	Chabot College	Nuclear Radiation
2.	California	Sonoma State College	Environmental Studies & Solar
3.	Colorado	Colorado Mtn. College	Mine Electrician
4.	Colorado	Colorado N.W.-Steamboat	Mine Electrician
5.	Colorado	Community College of Denver, Red Rocks	Solar Eng., Installation & Maintenance
6.	Ohio	Hocking Technical College	Oil Well Servicing & Maintenance
7.	Virginia	Mountain Empire Community College	Mine Supervision
8.	Virginia	Southwest Virginia Community College	Mine Machine Maintenance

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